

Section 451—Patching Portland Cement Concrete Pavement (Spall Repair)

451.1 General Description

This work includes partial depth patching of spalls and potholes in Portland cement concrete pavement by removing the broken, damaged, or disintegrated concrete pavement. This work also includes removing asphaltic concrete patches from spalled or damaged areas of the pavement surfaces and patching them with approved patching materials according to this Specification and the existing pavement cross-sections.

451.1.01 Definitions

General Provisions 101 through 150.

451.1.02 Related References

A. Standard Specifications

Section 504—Twenty-Four Hour Accelerated Strength Concrete

Section 800—Coarse Aggregate

Section 801—Fine Aggregate

Section 833—Joint Fillers and Sealers

Section 886—Epoxy Resin Adhesives

Section 934—Rapid Setting Patching Materials for Portland Cement Concrete

B. Referenced Documents

QPL 27

451.1.03 Submittals

General Provisions 101 through 150.

451.2 Materials

Ensure that the materials used to repair and patch Portland cement concrete pavement conform to the rapid setting patching material requirements.

The laboratory may waive the setting time requirements of approved materials if the minimum compressive strength development is unaffected.

451.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

451.3 Construction Requirements

451.3.01 Personnel

General Provisions 101 through 150.

451.3.02 Equipment

To clean the repair areas, use air compressors equipped with traps that can remove surplus water and oil in the compressed air. Ensure that the compressor can deliver compressed air at a continuous pressure of at least 90 psi (620 kPa).

The Engineer will check the compressed air daily for contamination. Do not use contaminated air.

451.3.03 Preparation

A. Removing and Preparing the Repair Area

Prepare to perform partial patching of spalled joints and potholes as follows:

1. Partial Depth Patching of Spalled Joints

- a. "Sound" each transverse joint and longitudinal joint with a visual defect to determine the limits of the damaged or defective areas. Strike the pavement surface along the sides of each joint with a hammer, chain drag, or similar tool to detect unsound concrete that sounds flat or hollow.

- b. Mark the limits of the defective areas on the pavement by making a rectangle 2 in (50 mm) beyond the outer limits of the unsound concrete area as a guide for sawing.
- c. Mark spalled areas less than 2 ft (600 mm) from each other along a joint as one spall area. If separated by 2 ft (600 mm) or more, mark as separate spall areas.
Do not repair defective (spalled) joint areas less than 6 in (150 mm) long and 1.5 in (40 mm) wide under this Specification. Thoroughly clean and seal them with silicone sealant as part of the joint sealing operation specified in Section 461.
- d. Saw the rectangular marked areas with near vertical faces at least 2 in (50 mm) but not more than 3 in (75 mm) deep.
- e. Remove unsound material within the sawed area with a maximum 30 lb (135 N) chipping hammer.
- f. Do not damage or fracture the sound concrete substrate to be left on the bottom of the spall area. Do not use sharp pointed bits.
- g. If the unsound material is more than 4 in (100 mm) deep, the Engineer may direct a 6 ft (1.8 m) slab replacement be placed, which is classified and paid for under Section 609 and Section 452.
- h. Before placing the patching material, saw the face of the existing transverse or longitudinal joints bordering the repair areas. Saw at least 5 in (125 mm) deep and 0.25 in (6 mm) wide with the full depth of the saw cut extending at least 1 in (25 mm) beyond the limits of the repair areas in each direction.
- i. Immediately before placing the patching material, thoroughly clean the surfaces within the repair areas by sandblasting and air blasting to remove oil, dust, dirt, traces of asphaltic concrete, slurry from saw operation, and other contaminants.
- j. Place a 0.25 in (6 mm) wide piece of closed cell polyethylene foam shaped to fit the saw cut in the joints bordering the repair areas.

If “back-to-back” repairs are made at a joint, support the 0.25 in (6 mm) closed-cell polyethylene foam during the placing operation to maintain a true, straight joint line.

Have the Engineer approve the method used. The polyethylene foam must be supported in a straight line when the patching material is placed so a straight joint line will be formed.

Maintain a straight line or the Engineer may require the repairs be repeated at no additional cost to the Department.

2. Partial Depth Patching of Pavement Potholes

The Engineer will determine which pavement potholes will be repaired.

Use the procedures given for repairing spalled joints to repair potholes within the pavement surface. The requirement of using the 0.25 in (6 mm) closed-cell polyethylene foam does not apply.

451.3.04 Fabrication

General Provisions 101 through 150.

451.3.05 Construction

A. Concrete Patching

Patch concrete one lane at a time, safely and rapidly to minimize inconvenience to the traveling public.

- 1. Accomplish the work with other operations in progress within an area if possible.
- 2. Complete the work before the grinding operation begins, if grinding is specified.
- 3. Remove and replace completed concrete patches that contain cracks, shrinkage, compression failures, or are damaged by construction or traffic before Final Acceptance at no additional cost to the Department.

B. Placing Patching Material

Use Repair Method 1 unless the State Materials Research Engineer gives written approval to use Repair Method 2. Use Repair Method 1 when the average daily temperature is 50 °F (10 °C) or above. Use of Repair Method 2, if approved, is limited to the manufacturer’s written recommendations.

For the following repair methods, begin the placement when the surface within the repair area is dry and thoroughly free of contaminants.

Ensure that the finished surface including joints meets a surface tolerance of 1/8 in (3 mm) per 10 ft (3 m).

Use approved measures as necessary to keep pavement surfaces adjacent to this operation free of excess grout and other materials. Unless otherwise specified, complete the patching operations and open the lanes to traffic before sunset each day.

1. Repair Method 1: Twenty-four Hour Accelerated Strength Concrete

Use this method as follows:

- a. Completely coat the concrete surface areas within the repair area with a film of Type II epoxy approximately 10 to 20 mils (0.25 to 0.50 mm) thick.
- b. Mix the concrete on site in a portable mixer. Obtain approval for the mix design and mixing method from the laboratory. The material must meet a slump range of 1.0 in. (25mm) to 3.0 in. (75mm).
- c. Deposit the concrete in the repair area while the epoxy is still tacky. Vibrate it to form a dense, homogeneous mass of concrete that completely fills the patch area.
- d. Screed the concrete to the proper grade and do not disturb it until the water sheen disappears from the surface.
- e. Cover the concrete with wet burlap or membrane curing compound. Allow the curing to continue for at least three hours. The Engineer may require longer curing to ensure sufficient concrete strength development before opening to traffic.

2. Repair Method 2: Rapid Setting Patching Material for Portland Cement Concrete Pavement

- a. In addition to the requirements outlined in Subsection 451.3.03.A, "Removing and Preparing the Repair Area," prepare the surfaces in the repair areas according to the manufacturer's written recommendations.
- b. Perform the patching material handling, mixing, placing, consolidating, screeding, and curing according to the manufacturer's written instructions as approved by the laboratory.
- c. Continue curing for at least one hour and until opening the section to traffic.

C. Special Requirements

The following special requirements apply to this work:

1. If repairing adjacent to an unstable shoulder, place a form the full depth of the repair area to maintain a true, straight shoulder joint and to prevent the patching material from intruding onto the shoulder area.
2. After curing the patching material, remove the form and repair the shoulder at no cost to the Department.
3. During sandblasting, protect traffic in the adjacent lanes.
4. After the sandblasting operations:
 - a. Thoroughly clean the area to be repaired with compressed air.
 - b. Remove sand from the sandblasting operation from the roadway and shoulders.
5. Do not "over-cut" the pavement beyond marked areas whenever possible.
6. Remove saw slurry and other contaminants from the over-cutting.
7. Repair the over-cuts by filling full-depth with an approved low-viscosity epoxy compound using a Type II epoxy adhesive specified in Section 886. Make these repairs as soon as possible, but not after the joint is resealed.
8. Re-establish original transverse and longitudinal joints by sawing and sealing the joints with silicone that meets the requirements of Subsection 833.2.06, the Plan details, and Section 461.
Re-establish the joints within 60 days after placing the patch. Ensure that re-established joints are at least 3/8 in (10 mm) wide.

451.3.06 Quality Acceptance

General Provisions 101 through 150.

451.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

451.4 Measurement

The area measured for payment is the number of square yards (meters) of patching complete in place and accepted.

451.4.01 Limits

General Provisions 101 through 150.

451.5 Payment

The area measured as specified above will be paid for at the Contract Unit Price per square yard (meter). Payment is full compensation for equipment, tools, labor, incidentals to complete the work, including but not limited to:

- Removing existing asphaltic concrete patching material or the spalled, broken, or damaged Portland cement concrete
- Cleaning the open area by sandblasting
- Furnishing, placing, finishing, and curing the patching material
- Sawing and sealing new transverse and longitudinal joints

Payment will be made under:

Item No. 451	Patching Portland cement concrete pavement	Per square yard (meter)
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451.5.01 Adjustments

General Provisions 101 through 150.

Section 452—Full Depth Slab Replacement

452.1 General Description

This work includes replacing Portland cement concrete pavement slabs, full or partial length. Remove the slabs according to the Plans or as directed by the Engineer. See Section 609.

452.1.01 Definitions

General Provisions 101 through 150.

452.1.02 Related References

A. Standard Specifications

Section 431—Grind Concrete Pavement

Section 461—Sealing Roadway and Bridge Joints and Cracks

Section 504—Twenty-Four Hour Accelerated Strength Concrete

Section 609—Removal of Portland Cement Concrete Roadway Slabs

Section 833—Joint Fillers and Sealers

Section 853—Reinforcement and Tensioning Steel

Section 886—Epoxy Resin Adhesives

B. Referenced Documents

GDT 72

452.1.03 Submittals

Obtain approval of the mix design from the Office of Materials and Research before using the mix.

452.2 Materials

Ensure that materials used in full depth slab replacement conform to the following Specifications:

Material	Section
Twenty-Four Hour Accelerated Strength Concrete	Section 504
Dowel Bars and Bar Coatings	Subsection 853.2.08
Epoxy	Section 886
Silicone Sealant	Subsection 833.2.06